"Reptiles of British India."—in fact, the classification and descriptions are mostly copied literally therefrom. It is quite true that Dr. Günther's name is frequently introduced, and that frequent passages borrowed from his work are quoted in inverted commas; but, even under these circumstances, we fail to see that Dr. Fayrer is quite justified in appropriating so largely the results of another author's labours to his own use. It would have been easy to state at once that so far as arrangement and classification went, he simply intended to follow those given in "The Reptiles of British India," and to refer his readers to that work for information on these subjects.

In the second section of his work, Dr. Fayrer gives details as to the actual number of deaths caused by snake-bites in India. These statistics were principally obtained from replies to letters on the subject addressed by him to the secretaries and political agents of the several governments. The result arrived at is that the total number of deaths recorded in 1869 in Bengal, the North West Provinces, Oude, and certain other parts of India, embracing altogether a population of about 120,000,000, was 11,416. This total, however, large as it is, Dr. Fayrer fears cannot be regarded as the real mortality in these provinces, the information upon which it is based having been partial and imperfect. Were accurate statistics obtainable from the whole of Hindostan, Dr. Fayrer believes that it would be found that more than 20,000 people die annually in that country from the bites of poisonous snakes. Such being the case, there can be no question as to the importance of the subject discussed in the work before us.

In his third section Dr. Fayrer speaks of the treatment of snake-bite, concerning which, after a certain amount of discussion, he does not appear to have arrived at any very novel results. Ligatures, scarifications, liquor ammoniæ, and hot spirits and water, are the remedies in vogue on such occasions, and to these Dr. Fayrer gives in his adhesion. "The antidotes in addition," he remarks, "may be used by those who have faith in them; but I fear that there is reason to believe that they are of no use." These antidotes, we should have explained, comprehend snake-stones, arsenic, bromine, ipecacuanha, senega, and, "indeed nearly every drug in or out of the pharmacopœia."

Numerous reports of cases of snake-bite by medical officers of the Indian Service constitute the fourth section of Dr. Fayrer's work. These have been selected in order to give a fair idea of the symptoms and of the duration of life after the reception of the bite, and of the pathological appearances after the death of the sufferer.

In the concluding portion of the volume, Dr. Fayrer gives an account of numerous experiments undertaken with a view to ascertain the influence of snake-poison on the lower animals, and the value of certain modes of treatment. These experiments were commenced in October 1867, and continued during a period of three years, the object having been to determine the effect of the bite of venomous serpents by actual observation, and to test the value of supposed remedies both internal and external. The snakes with which the experiments were performed were the Cobra, the *Ophiophagus* or Hamadryad, and the two Indian species of the genus *Bungarlus*, belonging to the Elapidæ, some of the sea-snakes of family Hydrophiidæ, the *Daboia russellii*, and the *Echis carinata*, belonging to the Viperidæ, and one species of *Trimeresurus*, belonging to the Crotalidæ, or Pit vipers. Of these Dr. Fayrer concludes that as regards deadliness the Cobra, *Ophiophagus*, and *Daboia* are very nearly on a par. "They are quite capable of destroying a full-grown dog in half an hour, sometimes in much less time; and frequently," Dr. Fayrer believes, "man has succumbed within an equally short period, though generally the time is much longer." The *Bungarlus cœruleus* is believed to be just as deadly as the above-named, but not to kill quite so quickly. The *Bungarlus fasciatus* is less fatal. The *Echis* is also very deadly, but from its small size less likely to be fatal to man. Of the sea-snakes much less is known, but it appears that human life would be in great danger from their bite. The Elapine snakes of the genus *Callophis* and the Pit-vipers of Hindostan, although capable of giving a painful and even a dangerous bite, are not nearly so deadly.

The symptoms produced by the bite of these different serpents vary slightly, but not so as to present any great physiological or pathological divergences. All alike point to "exhaustion and paralysis of the nerve-centres," every function falling rapidly, and life becoming quickly extinct. "The *post-mortem* appearances frequently reveal nothing except the marks of the fangs, or, if the creature has survived some hours, infiltration and perhaps incipient decomposition of the intestines." Warm-blooded animals are acted upon much more vigorously by snake-poison than cold-blooded animals. As regards the latter, poisonous snakes are not, according to Dr. Fayrer's experience, affected by their own poisons, or by that of one of their own species, although the less-poisonous seem to be subject to the venom of their more poisonous relatives. Lastly, although the blood of an animal killed by snake-poisoning destroys life if injected into another animal, there can be no doubt that the body of such an animal may be eaten with impunity. The fowls and pigeons killed in Dr. Fayrer's experiments were always eaten by the natives without any evil consequences following.

Such are some of the results arrived at from Dr. Fayrer's long and laborious series of experiments. We cannot say that there is any great novelty amongst them. As regards the treatment of snake-bite, indeed, it seems quite conclusively proved that the antidotes, commonly so called, are useless, and that it is hardly probable that any direct specific will ever be discovered. Cure failing, the large mortality now due to snake-bite can, therefore, only be materially diminished by prevention; and the simplest mode of prevention—slow as it may be—is, we think, that recommended by Dr. Fayrer in his circular of January 1870*, *i.e.* to offer small rewards for the destruction of the serpents. The sum expended in this way would, as Dr. Fayrer observes, no doubt be large, but the saving of human life thereby effected would be great.

OUR BOOK SHELF

Forstzoologie. Von Dr. Bernard Altum. I. Saügethiere. (Berlin: Springer, 1872. London: Williams and Norgate.)

DR. BERNARD ALTUM, Professor of Zoology in the Royal Academy of Forestry at Neustadt-Eberswald, gives us, in

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* See page 31 of Dr. Fayrer's work.

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the present volume, the first of a series of essays which he proposes to write for the instruction of his pupils and others in "Forest-zoology," *i.e.*, in Zoology with especial reference to the wants of those who are engaged in the care and preservation of forests. The present volume is devoted to the class of Mammals; a second will relate to the Birds; and a third to the Insects; these being the three principal divisions of the animal kingdom with which "foresters" are mostly brought into contact. Zoology in the abstract, or "scientific zoology," Dr. Altum observes, is the foundation upon which all knowledge of the various applications of zoology must be based. Dr. Altum therefore adopts a strictly scientific arrangement for his work, commencing with a definition of the class of Mammals, and taking the various groups of this class in systematic order. The work being intended for those whose labours are to be in the forests of Central Europe, only European species are included. But the *Quadrumana*, *Prosimiæ*, and other orders restricted to foreign countries, are introduced in their proper places, and some general information concerning them, together with a short account of their leading divisions, is given. Special attention is paid to those species of Mammals which the forester is most likely to be brought into contact with, such as the squirrels, field-mice, beaver, deer, and others; and full particulars are given of the modes in which forest trees are injured or attacked by them.

Dr. Altum's volume, thus composed, seems to be in every way well adapted for the purpose for which it is intended. Dr. Altum is fortunate in having, in Blasius' well-known work on European Mammals, an excellent guide to the scientific history of other animals, which he wisely follows. An English writer on the same subject would not be so well off, for the only modern work on British Mammals is now long ago out of print, and there seems to be no prospect of a second edition of it being published. In this, as in nearly every other branch of science, we have constantly to go to Germany for assistance.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. No notice is taken of anonymous communications.*]

The Meteorology of the Future

I CANNOT quite agree with Mr. Lockyer that the most important question in meteorology is the discovery of a cycle. Were it even so well proved, it would still be but an empirical law. In my opinion the chief desideratum of the science is a dynamical theory of barometric waves; and the data for this are to be found not merely in records of barometric fluctuations in one place, nor by comparing the records in several places at or near the sea level, but by comparing the records at places separated by the greatest possible vertical distance, though horizontally near each other. Such records do not yet exist, and they can be had only at specially chosen stations; the summit and the base of Teneriffe, for instance, or of Etna. The latter would probably be the best, as it is in the variables. It is not at all certain that the fluctuations of the barometer at the summit and at the base of a high mountain would be nearly alike. It is stated by Kaenitz that while the barometer in the hottest part of the day falls at the sea level, it rises at a height of a few thousand feet. The reason why it rises at the higher station is that the entire column of air is lifted up by the expansion due to heat, and thus a larger proportion of the column comes to be above the station. This cause does not act at the sea-level, and the barometer there falls in consequence of the outflow of air from the top of the column. It is much to be desired that the attention of scientific men and scientific committees should be directed to this subject, as without such sets of comparative observations we shall never have all the data for a complete theory of barometric waves.

Old Forge, Dunmurry JOSEPH JOHN MURPHY

Popular Science in 1872

SCIENTIFIC information in a popular form is one of the demands of the age, and we find it supplied even in publications by no means exclusively devoted to Science. It would be a great loss, however, to the professed students of science, if they should remain unacquainted with the following remarkable contributions to our knowledge of electricity, merely because they occur in the December number of *Belgravia*, in an article entitled "Is Electricity Life?" $\frac{dp}{dt}$

"The ocean, for instance, is compounded of water and salt; one is an electric, the other not. The friction of these causes the phosphorescent appearance so often observed at sea."

"That all created living bodies are electric there can be no question; and as little that some persons, animals, and plants, are more electric than others. Two forms of the latter are familiar. Few schoolboys are guiltless of experiments on poor puss, from whose much-enduring back electric sparks may be drawn, especially in dry frosty weather; and most young ladies have admired the elegant sensitive plant, whose leaves seem to move and feel,

> "and with quick horror fly the neighbouring hand,"

that draws from it the electricity which it contains more than other plants; and its leaves at once fall flaccidly, until a new supply of electric force renders them once more turgid.

"But bodies have not only electricity within them, but an electric atmosphere, of the form of the body which it surrounds, and which is attracted by it. Without this we could not shake hands with a friend, or kiss a lip, without the danger of the excess of electricity flying off and destroying us, or the he or she that we would greet or kiss. Perhaps it is the commingling of these electric atmospheres that makes kissing so nice.

"Two conditions of the human body are also illustrative of its varied electric action. A person who has the small-pox cannot be electrified, while sparks of electricity may be drawn from the body of a patient dying of cholera. In the first instance it appears that the body is fully charged with its own electricity, since it is impossible to electrify a body beyond a certain degree; in the latter there seems to be a tendency to part with the electric force which is essential to the support of life, and which may account for the distressing and rapid weakness of cholera-patients."

Upon the Direction in which the North Magnetic Pole has moved during the last two Centuries

IN an article upon Terrestrial Magnetism in the current number of the *Edinburgh Review*, referring to the fact that the compass-needle does not now in England point due north and south, and that it changes its position slightly from year to year, but that from our present ignorance of the source and laws of this change we cannot say that it will hereafter be as much in one direction as it has been in another, the writer remarks (p. 424): "Still the strictly *progressive* character of this change compels us to regard it as the expression of some determinate cause or causes. The question then arises, Where are these to be found? Now, from whatever point on the earth's surface we contemplate the phenomenon, we find ourselves in the presence of two distinct magnetic systems. This was first clearly recognised by Halley as a necessary consequence of even the scanty information at his command, and the accumulated observations of two hundred years have corroborated in a very remarkable manner the conclusions at which he arrived —that of these two systems one was *fixed* and the other *in motion*."

It is a matter of some interest to ascertain in what directions the system in motion has gone in the interval mentioned. Sir Edward Sabine gives us some information on this point. In his paper upon Terrestrial Magnetism, in "Johnston's Physical Atlas," p. 72, he says: "The change of longitude of the stronger pole, since Halley placed it on or about the middle of California, appears to have been small; but, on the other hand, the weaker pole, which is now found in Siberia, was placed by Halley near the meridian of the British Islands, and, adopting Halley's mode of reasoning, the present disposition of the lines of declination corresponds to this change."

Of the northern poles of the two magnetic systems in Halley's time, one appears to have been in the longitude of California, the

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